Detectability of the Reflection Signal from Inner Planets

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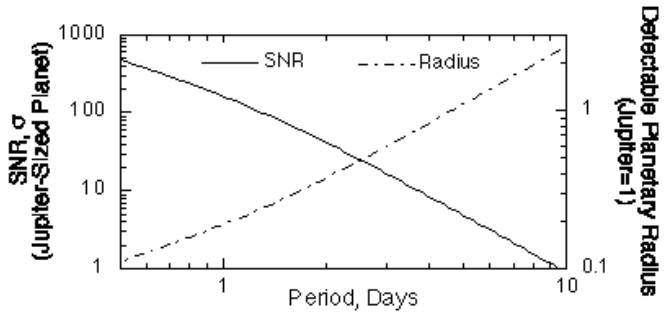
Mayor and Queloz (1996) and Marcy and Butler (1996) have found massive planets with orbital periods T_P= 4 days around two solar-like stars (51 Pegasi and $/upsilon$ Andromeda). These planets are most likely similar in size and composition to the gas giants in our solar system (Burrows et al 1996). Based on this expectation and assuming the same albedo as Jupiter, we examined the feasibility of searching for similar planets with a dedicated space-based 1-m telescope, which could potentially discover thousands of such planets. The Kepler mission will survey approximately 140,000 stars from 9 to 14 mag continuously for four years to detect transiting Earth-like planets. Giant short-period planets in a much wider range of orbital inclinations (i) will produce nearly sinusoidal modulations of the star light flux due to the varying planetary phases. The relative signal amplitudes are of order 2x10^{-5} and decrease as $T_P^{4/3}$ for i >> $0/deg$. We estimated the expected signal to noise ratio (SNR) using the solar irradiance measurements from the ACRIM 1 experiment (Willson, 1989) along with expected shot and detector noises. The survey will be sensitive to planets with periods from 12 hr to 8 days at the 6 $/sigma$ level, and will be able to detect planets much smaller than Jupiter.



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